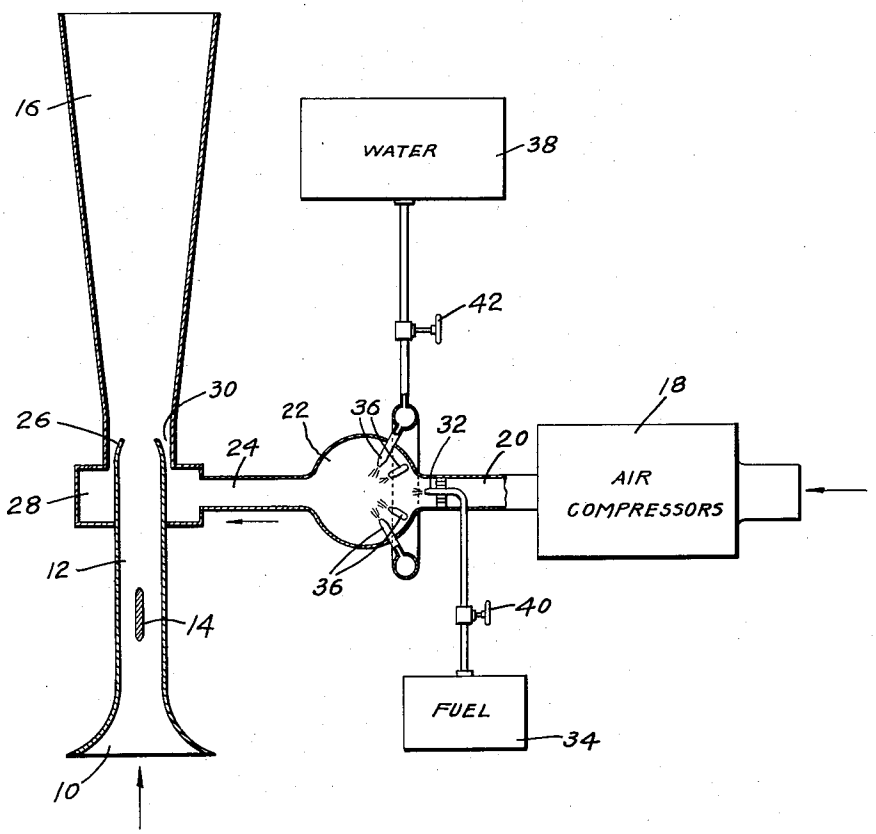
May 8, 1956 R. E. BROWNING 2,744,410

INDUCTION TYPE WIND TUNNEL

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INDUCTION TYPE WIND TUNNEL

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2 Claims. (Cl. 73—147)

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to a wind tunnel or induction type air blast, wherein rapid flow of air is induced for test purposes and the like.

Wind tunnels of the induction type usually comprise a nozzle wherein forced injection of compressed gas induces flow of air in the tunnel. The gas just mentioned may be air, steam, combustion products, or a mixture of these, forced under pressure to the nozzle, where it induces flow of atmospheric air through the tunnel. The present invention aims to increase the mass flow of said gas without greatly increasing the power requirements of the compressors which force it to the nozzle. This is accomplished by the use of burners which add their products of combustion to the gas, and by the injection of water which is vaporized by the heat generated by the burners and thereby cools the gas. The result is that considerable mass is added to the gas flow without correspondingly increasing the load on the compressors.

An object of the present invention is to provide an improved apparatus of the type above outlined.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following description.

In the drawing, the single figure is a diagram of apparatus embodying the invention.

The apparatus shown in the drawing comprises a wind tunnel having a flared inlet **10**, a cylindrical test section **12** which as shown contains an element **14** to be tested, a nozzle section described hereinafter, and a tapered outlet section **16**. A battery of air compressors is indicated at **18**, the outlet conduit **20** thereof connecting with a combustion chamber **22**, which in turn is connected to the nozzle section by a conduit **24**.

The nozzle section comprises a tapered extension **26** of the test section, related telescopically to the outlet section **16**, and an annular chamber **28** formed as an extension of the outlet section, receiving gases from conduit **24** and discharging them through an annular outlet **30** formed between elements **26** and **16** and forming therewith a species of Venturi. Passage of gases through said outlet acts, in accordance with known principles, to induce a flow of air through the wind tunnel.

In order to increase the mass flow through conduit **24**, a burner **32** is disposed at the entrance to the combustion chamber, being supplied with fuel from a reservoir. **34**. Posterior to burner **32** a plurality of atomizing nozzles **36** spray water into the combustion chamber,

being supplied from a pressure reservoir **38**. The rate of supply of fuel and water to burner **32** and nozzles **36** is controlled by valves **40** and **42**.

In the operation of the device, the compressors **18** are started, valves **40** and **42** are opened, and burner **32** lighted. Atmospheric air is compressed at **18** and passes through conduit **20**. Upon passing burner **32**, most of the oxygen of said air is consumed, being replaced by combustion products. Nozzles **36** spray water into the gaseous mixture in such quantities as to reduce its temperature to the desired value and also to materially increase the mass of the mixture. The mixture then passes to the nozzle section, where it induces flow through the wind tunnel.

Introduction of water in the manner just described has advantages over introduction of steam from a boiler, since a boiler is costly compared to a burner, and the boiler requires large quantities of pure water which cannot be recovered by condensation. The present apparatus can utilize water having a high content of impurities.

Use of the present invention substantially reduces the power required at the compressors, for a given rate of mass flow through conduit **24** and through the wind tunnel.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In a wind tunnel, a tubular section, an annular chamber formed at one end of said section and having an annular outlet opening thereto, a tubular test section having an inlet opening to atmosphere and an outlet end traversing said chamber and forming with said outlet opening a constricted annular Venturi, a conduit supplying gases under pressure to said chamber and said Venturi to induce flow of air through said test section, a combustion chamber in said conduit, means for supplying air under pressure to said combustion chamber, a burner in said combustion chamber, and means for spraying water into said combustion chamber posterior to said burner.

2. In a wind tunnel, a tubular section having at one end an annular chamber formed with an annular outlet opening to said tubular section, a tubular test section having an inlet opening to atmosphere and an outlet end forming with said outlet opening a constricted annular Venturi, a conduit supplying gases to said chamber and annular outlet to induce flow of air through said test section, a combustion chamber in said conduit, a burner in said combustion chamber, and means for supplying water to said combustion chamber posterior to said burner.

References Cited in the file of this patent

UNITED STATES PATENTS

2,309,938	Diserens	Feb. 2, 1943
2,424,654	Gamble	July 29, 1947
2,515,069	Zola	July 11, 1950
2,551,229	Alford et al.	May 1, 1951
2,592,322	Nerad	Apr. 8, 1952

FOREIGN PATENTS

638,052	Great Britain	May 31, 1950